25.6%, 55.3%), and 55.6% for L5S1 (95% CI = 43.3%, 67.2%); two level FJA was not observed. The prevalence was significantly greater at the L5S1 level for symptomatic FJA than asymptomatic FJOA ($p<0.01$); the rates were not significantly different at level L45 ($p=0.49$). Comparisons were not performed at other levels since FJA/FJOA was not observed in both groups.
Conclusion: CLBP due to FJA most commonly occurs at L5S1. Morphologic abnormalities indicative of FJOA in asymptomatic adults occur most commonly at L45. These findings suggest that arthritic changes alone are not the sole etiologic factor mitigating FJA related CLBP.

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LAMIN A DEREGULATION IN HUMAN MESENCHYMAL STEM CELLS PROMOTES AN IMPAIRMENT IN THEIR CHONDROGENIC POTENTIAL AND IMBALANCE IN THEIR RESPONSE TO OXIDATIVE STRESS

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Purpose: Previous work by our group and others indicated that an accumulation of lamin A (LMNA) was associated with the osteoarthritis (OA) chondrocyte phenotype. Mutations of this protein are linked to laminopathies and specifically to Hutchinson-Guilford Progeria Syndrome (HGPS), an accelerated aging disease. Some authors have proposed that a deregulation of LMNA affects the differentiation potential of stem cells. In the present study, we examined the effect of the over-expression of LMNA, or its mutant form progerin (PG), on the mesoderm differentiation potential of MSCs.
Methods: Mesenchymal stem cells (MSCs) from human umbilical cord (UC) stroma have previously been isolated, expanded and differentiated towards mesoderm cell lineages. For efficient gene delivery of wt LMNA, PG and GFP (Green Fluorescence Protein), we used a lentiviral expression system. GFP-transduced MSCs were used as control for the differentiation study since they present a differentiation capacity similar to that of untransduced MSCs. Osteogenic potential was studied by with alizarin red staining to assess calcium deposits as well as Real-Time PCR of ALP, OC and Runx2 to assess early and late osteogenic differentiation. Adipogenic potential was studied with Oil Red staining for lipid droplets and Real-Time PCR of LPL, FABP and ADIPOQ, for early and late adipogenic differentiation. Chondrogenesis and hypertrophy were studied using immunohistochemestry and Real-Time PCR of Aggrecan, MMP-13, Type II Collagen, Type I Collagen and Type I Collagen.
Results: We found that over-expression of LMNA or PG by lentiviral gene delivery leads to defects in differentiation potential. PG-transduced MSCs present defects in adipogenic and osteogenic potential, The chondrogenic potential is defective in PG-MSCs, which present a decrease in COL2 and Aggrecan as revealed by both immunohistochemystry and Real-Time PCR. LMNA and PG-transduced MSCs have an increase in hypertrophy markers (MMP-13 and Type X Collagen) during chondrogenic differentiation, as well as a decrease in manganese superoxide dismutase (MnSODM) and an increase of mitochondrial MnSODM-dependent reactive oxygen species (ROS). ROS synthesis was partially (51%) and totally reverted by N-Acetyl Cystein, ROS scavenger, (NAC) at 20 and 40 μg/mL respectively for 1 hour in culture. In addition, defects in chondrogenesis detected by immunohistochemestry and Real Time-PCR are partially reversed by incubations with NAC at 40 μg/mL for 1 hour.
Conclusions: Our results suggest that OA process could be enhanced by defects in stem cell differentiation, partially due to imbalance in oxidative stress.

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SYNGENEIC, MINOR MISMATCHED, AND MAJOR MISMATCHED TRANSPLANTATION OF MESENCHNMAL STEM CELLS DERIVED FROM SYNOVIUM IN A RAT MASSIVE MENISCAL DEFECT MODEL

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Purpose: We previously reported that intraarticular injection of mesenchymal stem cells (MSCs) derived from synovium promoted meniscal regeneration in a rat massive meniscal defect model
Great number of reports described that bone marrow MSCs had immunoprivileged effects as well as immunosuppressive effects and that allogeneic transplantation of bone marrow MSCs enhanced regeneration in injury models. However, this is still controversial, and the opposite results were also reported. As far as synovial MSCs, the influence of allogeneic transplantation have not been investigated at all.
In this study, we performed syngeneic transplantation and allogeneic transplantation of synovial MSCs into the knee joints whose medial menisci were removed. The area of regenerated menisci were compared among the allogeneic transplantation groups, the major antigen mismatch group and the minor antigen mismatch group.
Methods: Cell isolation and culture. This study was approved by institutional animal use committee. Synovium was harvested from the knee joint of 3 strains, F344, Lewis, and ACI rats. After collagenase digestion, nucleated cells derived from synovium were expanded and colony forming cells were collected for transplantation.
Meniscectomy: As recipients, only F344 rats at 10-12 weeks of age were used. Under anesthesia, a straight incision was made on the anterior side of the right knee, the anteromedial side of the joint capsule was cut, and the anterior horn of the medial meniscus was dislocated anteriorly with a forceps. The meniscus was then cut vertically at the level of medial collateral ligament, and anterior half of medial meniscus was removed.
Transplantation: Immediately after the skin incision was closed, $5x10^6$ synovial MSCs in 50 μl PBS were injected into the right knee joint of F344 rats. Transplantation of synovial MSCs derived from F344 rat is a syngeneic model. Transplantation of synovial MSCs derived from Lewis rat is a minor antigen mismatch model, in which histocompatibility antigens differ partly. Transplantation of synovial MSCs derived from ACI rat is a major antigen mismatch model, in which histocompatibility antigens differ greatly. Macroscopic and microscopic features for menisci were examined, and regenerative area of menisci was measured 4 weeks after the surgery. ($n=6$).
Results : In the case of synovial MSCs derived from F344 and Lewis rat were transplanted, into the knee of F344 rat, the regenerative area was significantly larger in the transplantation side than in the contrateral side ($n=6$; $p=0.034$). Contrarily, in the case of synovial MSCs derived from ACI rat were transplanted, into the knee of F344 rat, there was no significant difference of the regenerative area between in the transplantation side and in the contralateral side. The regenerative area of medial meniscus in the ACI transplantation group was significantly smaller than in the F344 and ACI groups ($n=6$; $p<0.03$).
Conclusion: For regeneration of removed meniscus, similar results were obtained between the syngeneic transplantation and the minor mismatch transplantation model. In the major mismatch model, the results were inferior to the other models.

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CHONDROGENIC DIFFERENTIATION POTENTIAL OF CD56+ SATELLITE CELL AND PDGFRα+ MESENCHYMAL STEM CELL DERIVED FROM HUMAN SKELETAL MUSCLE

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Purpose: We recently identified that murine-derived platelet derived growth factor-α positive mesenchymal stem cells (PDGFRα+ cells) have the capacity for adipogenic and osteogenic differentiation *in vitro and vivo* (Nature Cell, 2010). We also previously reported that two distinct stem cells, CD56+ satellite cells and PDGFRα+ cells were identified in human skeletal muscle and the human PDGFRα+ cells showed successful engraftment and bone-like tissue formation *in vivo*. However, chondrogenic differentiation potential of human skeletal muscle-derived stem cell is still unknown. The purpose of this study is that the CD56+ satellite cells and PDGFRα+ mesenchymal stem cells derived from human skeletal muscle are evaluated for their capacity for chondrogenic differentiation *in vitro*.
Methods: In this study, we used the human muscular tissue of patients with osteoarthritis of hip, after informed consent were obtained at the time of hip surgery. After enzymatic digestion of human skeletal muscle,